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EXAMINER	
CHAWAN, SHEELA C	
ART UNIT	**PAPER NUMBER**
2625	13

DATE MAILED: 05/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/844,232	BEATY ET AL.
	Examiner	Art Unit
	Sheela C Chawan	2625

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-120* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-120* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 April 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 4.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Preliminary Amendment

1. In response to Preliminary Amendment filed on Sep 05 2003, (paper # 12/A).

Drawings

2. Drawings filed on 4/27/01 have been approved by the Examiner.

Information Disclosure Statement

3. The information disclosure statement filed 3/7/02 (paper # 5) is not in the application. Please provide this information disclosure statement.

Double Patenting

4. Claims 1-86 of provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-88 of copending Application No. 09/844,626. Although the conflicting claims are not identical, they are not patentably distinct from each other because.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

As to claim 1, discloses a three dimensional inspection method for inspecting ball array devices having a plurality of balls, wherein the ball array device is positioned in an optical system, the inspection method comprising the steps of (see 09/ 844,626 preamble line 5):

a) an illuminator located to illuminate at least one ball on the ball array device (see 09/844,626, page 47, line 6);

b) a sensor (see 09/844,626, page 47, line 7);

c) a first optical element positioned to transmit light to the sensor (see 09/844,626, page 47, line 7-11);

d) a second optical element positioned to direct light from the at least one ball to the sensor, where the sensor, the first optical element and the second optical element cooperate to obtain at least two differing views of the at least one ball, the sensor providing an output representing the at least two differing views (see 09/844,626, page 47, line 7-11); and

e) a processor, coupled to receive the output, where the processor processes the output by using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculate calibration plane (see 09/844,626, page 47, line 13 -15).

As to claims 2, 25 and 74, please refer claims 2, 25, 27, 49 and 72 of 626.

As to claims 3, 26 and 49, please refer claims 3, 26 and 50 of 626.

As to claims 4, 27 and 50, please refer claims 4, 27 of 626.

As to claims 5 and 75, please refer claims 5,73, 83-86 of 626.

As to claims 6, 28, 51 and 76, please refer claims 6, 28, 51 and 74 of 626.

As to claims 7, 29, 60 and 77, please refer claims 7, 29, 60 and 75 of 626.

As to claims 8, 30 and 61, please refer claims 8, 30, and 61 of 626.

As to claims 9 and 78, please refer claims 9 and 76 of 626.

As to claims 10 and 79, please refer claim 10 of 626.

As to claims 11, 45, 34, 58 and 80, please refer claims 11,34,58,63,78 and 88 of 626.

As to claims 12, 35, 59 and 85, please refer claims 12, 35, and 59 of 626.

As to claims 13, 38, 52 and 81, please refer claims 13, 38, 52 and 79 of 626.

As to claims 14, 39, 53 and 86, please refer claims 14, 39, 53 and 87 of 626.

As to claims 15, 40 and 65, please refer claims 15, 40 and 65 of 626.

As to claims 16, 41 and 66, please refer claims 16, 41 and 66 of 626.

As to claims 17, 42 and 67, please refer claims 17, 42 and 67 of 626.

As to claims 18, 43 and 68, please refer claims 18, 43 and 68 of 626.

As to claims 19, 36, 56, 69, 70,71, 82 and 83, please refer claims 19, 36,56 and 81 of 626.

As to claims 20, 37,57 and 84, please refer claims 20, 37,57 and 82 of 626.

As to claims 21, 46 and 64, please refer claims 21,46 and 64 of 626.

As to claims 22 and 45, please refer claims 22 and 45 of 626.

As to claims 23, 47,62 and 73, please refer claims 23, 47, 62 and 71 of 626.

As to claim 24, claim 24 recites similar limitation as claim 1 above and similarly analyzed except for the step of a frame grabber coupled to the sensor to transmit image information from the sensor (note, frame grabber is essential component for capturing and transmitting images, please refer claim 1 of 626).

As to claims 31 and 44, please refer claims 55 and 80 of 626.

As to claims 32 and 54, please refer claims 32 and 54 of 626.

As to claims 33 and 55, please refer claims 33 of 626.

As to claims 34 and 55, please refer claims 33 of 626.

As to claims 31 and 44, please refer claims 55 and 80 of 626.

As to claims 32 and 54, please refer claims 32 and 54 of 626.

As to claims 33 and 55, please refer claim 33 of 626.

As to claim 48, claim 48, recites similar limitation as claim 1 above and similarly analyzed except for the step of a sensor disposed to receive light at a first angle relative to the ball array device, and wherein the sensor includes a solid state sensor array (note, when capturing images of ball grid array the camera is position in such a way that it views different angle, please refer claim 1 of 626).

As to claim 72, claim 72, recites similar limitation as claim 1 above and similarly analyzed except for the step of a camera disposed in a fixed relative to the ball array device for taking ... obtain a circular doughnut shape image from at least one ball (note, when capturing image of ball grid array device the image is essential is circular doughnut shape image, please refer claim 1 of 626).

Claim Rejections - 35 U.S.C. § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-7, 9-29, 34- 43, 45-53, 56-60, 62-86, are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US.5,859,924) in view of Shenghua Ye et al. " Vision -based system calibration for dimensional inspection ".

As per claim 1, Liu discloses a three dimensional inspection method for inspecting ball array devices having a plurality of balls, wherein the ball array device is positioned in an optical system, the inspection method comprising the steps of:

a) an illuminator located to illuminate at least one ball on the ball array device (column 2, lines 59- 63);

b) a sensor (fig 3, item 308);

c) a first optical element positioned to transmit light to the sensor (fig 3, item 308);

d) a second optical element positioned to direct light from the at least one ball to the sensor (fig 3, item 304), where the sensor, the first optical element and the second optical element cooperate to obtain at least two differing views of the at least one ball, the sensor providing an output representing the at least two differing views (column 4, lines 6- 29); and

Regarding claim 1 Liu discloses method and system for measuring object features. The invention is directed to simultaneously collecting three-dimensional and two- dimensional data concerning features of an object and determines the dimension and relative positions of the features. Liu is silent about specific details of processing the output using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculate calibration plane. However, Shenghua Ye et al. discloses Vision -based system calibration for dimensional inspection .The system comprises of:

e) a processor, coupled to receive the output, where the processor processes the output by using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculate calibration plane (page 731 page 731-732, paragraph 1, 2 system description and calibration model and paragraph 3, calibration and measurement experiments), use of processing the output using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculate calibration plane because to produce reasonable accuracy in 3-D inspection page 731, abstract paragraph) .

Therefore, it would have been obvious to one with ordinary skill in the art at the time of invention to have modified Liu to include processing the output using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculate calibration plane. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Liu by the teaching

of Shenghua Ye et al 's in order to produce reasonable accuracy in 3-D inspection (as suggested by Shenghua at et. at page 731, abstract paragraph).

As per claims 2 - 4, 25 - 27,49, 50 and 74, Shenghua at et discloses the three dimensional inspection method wherein the pre-calculated calibration plane comprises a coordinate system having X, Y and Z axes and wherein a X measurement value is proportional to a Z measurement value (page 731- 732, paragraph 2 system description and calibration model and paragraph 3, calibration and measurement experiments).

As per claims 5 and 75, Liu discloses the three dimensional inspection method wherein the triangulation method is based on determining a center (column 3, lines 14-32) of the ball in a first view and determining a ball top location in a second view (column 2, lines 64- 67, column 4, lines 6-26, 61- 63).

As to claims 6, 28, 51 and 76, Shenghua at et discloses the three dimensional inspection method wherein the pre-calculated calibration plane is defined by measuring a calibration pattern (page 731- 732).

As per claims 7, 29, 60, 77, Liu discloses the three dimensional inspection method wherein the second optical element comprises a mirror (column 8, lines 28- 37).

As per claims 9 and 78, Shenghua at et discloses the three dimensional inspection method of claim 1, wherein one of the at least two differing views is obtained at low angle of view (page 732- 733, fig 5).

As to claim 10 and 79, Shenghua the three dimensional inspection apparatus of wherein the sensor and the second optical element are positioned to receive light from different angles relative to the calibration plane (page 732- 733, fig 5).

As per claims 11, 22, 34,45, 58 and 80, Shenghua at et discloses the three dimensional inspection method wherein the sensor comprises a charged coupled device array (fig 1, column 2, lines 57- 58).

As per claim 12, 35, 59 and 85, Liu discloses the three dimensional inspection method wherein the sensor comprises a complementary metal oxide semiconductor device array (note, any sensor devices would comprises of a detection system which are made up of many metal oxide semiconductor array. These detection devices such as sensors has a characteristics and can be considered as a common feature of any such devices, column 2, lines 49- 58).

As per claims 13, 38, 52 and 81, Liu discloses the three dimensional inspection method wherein the processing step further includes the step of applying gray scale edge detection to locate ball positions (column 3, lines 14- 32).

As per claims 14, 39, 53 and 86, Liu discloses the three dimensional (column 9, lines 6- 12) inspection method wherein the processing step further includes the step of applying threshold analysis (column 5, lines 38- 61)

As per claims 15, 40, 65 and 82, Liu discloses three dimensional inspection method wherein the first optical comprises a lens (fig 3, column 8, lines 25- 31).

As per claims 16, 41 and 66 Liu the three dimensional inspection method wherein the first optical element comprises a pin-hole lens, (note, optical system inherent has pin-hole lens, fig 3 column 8, lines 30- 37).

As per claims 17, 42 and 67, Liu discloses the three dimensional inspection method wherein the first optical element comprises a plurality of lens elements, (note, optical system has plurality of lens, column 8, lines 21- 36).

As per claims 18, 43 and 68, Liu the three dimensional inspection method wherein the first optical element comprises a telecentric lens, (note, optical system inherent has telecentric of lens, column 18, lines 34- 37).

As per claims 19, 36,56,69,70,71 and 83, Liu discloses the three dimensional inspection method wherein the ball array devices comprise ball grid array devices (note solder ball or bump is considered as ball grid array, column 3, lines 16- 19, column 5, lines 18-19, column 6, lines 40- 42).

As per claims 20, 37, 57 and 84, Liu discloses the three dimensional inspection method wherein the array devices comprise bump on wafer devices (note solder ball or bump is considered as ball grid array, column 3, lines 16-19, column 5, lines 18- 19, column 6, lines 40- 42).

As per claims 21, 46 and 64, Liu discloses the three dimensional inspection method wherein the step of processing the output is carried out on a personal computer, (note, optical system inherently has a processor and computer, column 7, lines 43- 48).

As per claims 23, 47, 62 and 73, Liu discloses the three dimensional inspection method wherein one of the views comprises a segment having a crescent shape (column 2, lines 10- 22).

As per claim 24, Liu discloses a three dimensional inspection method for inspecting ball array devices having a plurality of balls, wherein the ball array device is positioned in an optical system, the inspection method comprising the steps of:

a) an illuminator located to illuminate at least one ball on the ball array device (column 2, lines 59- 63);

b) a sensor (fig 3, item 308);

c) a first optical element positioned to transmit light to the sensor (fig 3, item 308);

d) a second optical element positioned to direct light from the at least one ball to the sensor (fig 3, item 304), where the sensor, the first optical element and the second optical element cooperate to obtain at least two differing views of the at least one ball, the sensor providing an output representing the at least two differing views (column 4, lines 6- 29); and

e) a frame grabber coupled to the sensor to transmit image information from the sensor (note, frame grabber is essential component for capturing and transmitting images, fig 11, item 1101, column 7, lines 35- 57).

Liu is silent about specific details of processing the output using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculate calibration plane. However, Shenghua Ye et al. discloses Vision - based system calibration for dimensional inspection .The system comprises of:

f) a processor, coupled to receive the image information, where the processor applies triangulation calculation to measurements of the image information so as to

calculate a three dimensional position of the at least one ball with reference to a pre-calculated calibration plane (page 731 page 731- 732, paragraph 1, 2 system description and calibration model and paragraph 3, calibration and measurement experiments), use of processing the output using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculate calibration plane because to produce reasonable accuracy in 3-D inspection page 731, abstract paragraph).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of invention to have modified Liu to include processing the output using a triangulation method to calculate a three dimensional position of the at least one ball with reference to a pre-calculate calibration plane. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Liu by the teaching of Shenghua Ye et al 's in order to produce reasonable accuracy in 3-D inspection (as suggested by Shenghua at et. at page 731, abstract paragraph).

As per claim 47, Liu discloses the three dimensional inspection method wherein the second optical element reflects a view to the sensor where at least one ball of the ball array device exhibits a crescent shape (column 2, lines 10- 22).

As per claim 48, the same limitations as set forth in claim 1 are contained as an independent claim (refer to claim 1, for common features) except for step of claim 48, recites f) processing the image information by applying triangulation calculation measurements of the image information so as to a three dimensional position of at least one ball with reference to a pre-calculated calibration plane, wherein the calibration

plane comprises a coordinate system having X,Y and Z axes, and wherein an X measurement value is proportional to a Z measurement value (page 731- 732 , paragraph 2 system description and calibration model and paragraph 3, calibration and measurement experiments).

As to claim 72, is representative of claim 1.

As to claim 63, Liu discloses the three dimensional inspection apparatus wherein the image acquisition apparatus comprises o frame grabber (note, frame grabber is essential component for capturing and transmitting images, fig 11, item 1101, column 7, lines 35- 57).

6. Claims 31, 33, 44, 47 and 55, are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US. 5,859,924) in view of Shenghua Ye et al. " Vision - based system calibration for dimensional inspection ", as applied to the above claims (1-7, 9-29, 34-43,45-53, 56-60,62-86, and further in view of King et al.(US.6, 236, 747).

Regarding claims 31,33, 44, 55, Liu discloses a method and system for measuring object features. Liu fails to specifically mention about illuminator comprises a ring light. However, King discloses system and method for image subtraction for ball and bumped grid array inspection where the ring illumination apparatus 20 includes a substantially ring -shaped light source 24 that generates light beams and directs the light beams into the field of view on the article, column 5, lines 41- 58). It would have been obvious to one with ordinary skill in the art at the time of invention to incorporate the teaching of an illuminator comprises a ring light as taught by King 's into the system of Liu. The motivation for doing so is to detect quickly and accurately

absence/presence of the illuminated reflective elements, determines their position, and measures the size and shape, e.g. the diameter and circularity of any protruding object, if desired, as suggested by King at (column 3, lines 11- 15).

7. Claims 8, 30 and 61, are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al.(US.5,859,924) in view of Shenghua Ye et al. " Vision -based system calibration for dimensional inspection ", in view of King et al.(US.6, 236, 747), as applied to the above claims 1- 7, 9-29, 31, 33-53, 55-60, 62-86, and further in view of Svetkoff et al. (US. 5,617,209).

Regarding claims 8, 30 and 61, Liu discloses method and system for measuring object features. Liu fails to teach the optical element comprises a prism. However, Svetkoff discloses method and system for triangulation -based, 3-D imaging utilizing an angled scanning beam of radiant energy. The system comprises of a three dimensional inspection method wherein the second optical element (note, fig 8 consists of optical system, comprises a prism (column 11, lines 21- 26), use of optical device such as prism, because the system provides a method which improves the reliability and accuracy of the measurement system by providing a consistent lead orientation, thereby alleviating data reduction requirements (column 6, lines 19- 23).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of invention to incorporate the teaching of step wherein the optical element comprises a prism as taught by Svetkoff's into the system of Liu because, one with ordinary skill in the art would realize that it improves the reliability and accuracy of the

measurement system by providing a consistent lead orientation, thereby alleviating data reduction requirements, as suggested by Svetkoff at (column 6, lines 19- 23).

8. Claims 32 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al. (US.5, 859,924) in view of Shenghua Ye et al. " Vision -based system calibration for dimensional inspection ", in view of King et al. (US.6, 236, 747), in view of Svetkoff et al., (US. 5,617,209), as applied to the above claims 1- 31, 33 - 53, 55-86, and further in view of Roy et al., (US. 6,118,540).

Regarding claims 32 and 54 Liu discloses method and system for measuring object features. Liu fails to teach step of illuminating with a plurality of light emitting diodes. However, Roy discloses method and apparatus for inspecting a work piece. The system comprises of the three dimensional inspection method wherein the step of illuminating comprises the step of illuminating with a plurality of light emitting diodes (column 2, lines 52- 63), use of plurality of light emitting diodes, because to provide appropriate coverage of the object (column 2, lines 52- 63).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of invention to incorporate the teaching of step of illuminating with a plurality of light emitting diodes as taught by Roy's into the system of Liu because, one with ordinary skill in the art would realize that having more light emitting diodes can provide an appropriate coverage of the object, as suggested by Roy at (column 2, lines 52- 63).

9. Claims 87-120 of provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 33-66 of

copending Application No. 09/351,892. Although the conflicting claims are not identical, they are not patentably distinct from each other because.

As per claims 87 and 104, a method for three-dimensional inspection of a lead on a ball array device the method comprising of (see 09/351,892, claim 33 page 4, preamble lines 1 - 3):

illuminating the lead (see 09/351, 892, page 4, line 4);

providing fixed optical elements to obtain both-a bottom view of the lead and a side perspective view of the lead (see 09/351, 892, page 4, lines 5 - 6);

receiving at least the bottom view and the side perspective view of the lead using a camera (see 09/351, 892, page 4, lines 7-8);

transmitting the bottom view and the side perspective view of the lead to memory as pixel values (see 09/351, 892, page 4, lines 9 - 10);

determining a first lead reference pixel position in the bottom view (see 09/351, 892, page 4, lines 11- 12);

determining a second lead reference pixel position in the side view (see 09/351, 892, page 4, lines 13 - 14);

converting the first and second lead reference pixel positions into a world value by using pixel values and parameters determined during a calibration view (see 09/351, 892, page 4, lines 15 - 17);

As to claims 88 and 105, please refer claims 34 and 51of 892.

As to claims 89 and 106, please refer claims 35 and 52 of 892.

As to claims 90 and 107, please refer claims 36 and 53 of 892.

As to claims 91 and 108, please refer claims 37 and 54 of 892.

As to claims 92 and 109, please refer claims 38 and 55 of 892.

As to claims 93 and 110, please refer claims 39 and 56 of 892.

As to claims 94 and 111, please refer claims 40 and 57 of 892.

As to claims 95 and 112, please refer claims 41 and 58 of 892.

As to claims 96 and 113, please refer claims 42 and 59 of 892.

As to claims 97 and 114, please refer claims 43 and 60 of 892.

As to claims 98 and 115, please refer claims 44 and 61 of 892.

As to claims 99 and 116, please refer claims 45 and 62 of 892.

As to claims 100 and 117, please refer claims 46 and 63 of 892.

As to claims 101 and 118, please refer claims 47 and 64 of 892.

As to claims 102 and 119, please refer claims 48 and 65 of 892.

As to claims 103 and 120, please refer claims 49 and 66 of 892.

DETAILED ACTION

Claim Rejections - 35 U.S.C. § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(a) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claims 87- 91 and 104 -108, are rejected under 35 U.S.C. 103(a) as being unpatentable over Toh(US.6, 141,040) in view of Toh (US.6,055,055).

As per claims 87 and 104, Toh discloses a method for three-dimensional inspection of a lead on a ball array device the method comprising (abstract, column 1, lines 17- 37):

illuminating the lead (column 3, lines 42- 57);

providing fixed optical elements to obtain both-a bottom view of the lead and a side perspective view of the lead (column 1, lines 29- 37, 60- 67, column 3, lines 42- 57, column 4, lines 21- 38, column 5, lines 9- 21);

receiving at least the bottom view and the side perspective view of the lead using a camera (column 1, lines 29- 37, 60- 67, column 3, lines 42- 57, column 4, lines 21- 38, column 5, lines 9- 21);

transmitting the bottom view and the side perspective view of the lead to memory as pixel values (column 4, lines 21- 37, column 5, lines 10- 39);

determining a first lead reference pixel position in the bottom view (column 1, lines 29- 37, 60- 67, column 3, lines 42- 57, column 4, lines 21- 38, column 5, lines 9-21);

determining a second lead reference pixel position in the side view (column 1, lines 29- 37, 60- 67, column 3, lines 42- 57, column 4, lines 21- 38, column 5, lines 9-21);

Toh discloses measurement and inspection of leads on integrated circuit packages, Toh fails to specifically mention about converting the first and second lead reference pixel positions into a world value by using pixel values and parameters determined during a calibration.

Toh discloses an inspection system by optical means and more specifically to an optical inspection system for inspecting integrated circuits by imaging. The system comprises:

converting (image acquisition module 12 consists of a frame grabber which receives the video signal from the video camera 24 and converts it into digital format, column 6, lines 62- 67) the first and second lead reference pixel positions (column 6, lines 23- 61) into a world value by using pixel values and parameters determined (column 6, lines 34- 67) during a calibration (column 6, line 23 through column 7, line 29). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Toh to include a converting the first and second lead reference pixel positions into a world value by using pixel values and parameters determined during a calibration). It would have been obvious to one of ordinary skill in the art at the time of invention to have modified Toh by the teaching of Toh in order to obtain distance in absolute units (e.g., mm, micron) between points in the object in different co-ordinates, (as suggested by Toh at column 6, lines 55- 61).

As per claims 88 and 105, Toh (040) discloses the method wherein illuminating the lead is achieved using a single light source (column 3, lines 42- 57).

As per claims 89 and 106, Toh (040) discloses the method wherein illuminating the lead is achieved using more than one light source (column 3, lines 42- 57).

As per claims 90 and 107, Toh (040) discloses the method wherein the bottom view of the lead and a side perspective view of the lead are obtained in a single image (column 2, lines 38- 41, 45- 47, column 3, lines 15- 33, column 6, lines 20- 50).

As per claim 91 and 108, Toh (040) discloses the apparatus , wherein the bottom view of the lead and a side perspective view of the lead are obtained in more than one image (column 2, lines 38- 41, 45- 47, column 3, lines 15- 33, column 6, lines 20- 50).

11. Claims 92-103 and 109-120, are rejected under 35 U.S.C. 103(a) as being unpatentable over Toh (US.6, 141,040) in view of Toh (US.6,055,055) as applied to claims 87- 91 and 104 –108 above and further in view of Kaplan et al. (US.6,096,567).

Regarding claims 92 and 109,Toh discloses measurement and inspection of leads on integrated circuit packages, Toh fails to specifically mention about the parameters determined during the calibration are selected from the group consisting of: pixel scale factors, an angle at a particular point in a view, and correspondence of one or more pixel values to world values.

Kaplan discloses method and apparatus for direct probe sensing. The system comprises:

wherein the parameters determined during the calibration (column 7, lines 3-60, column 9, lines 14- 59, column 10, lines 16- 53) are selected from the group consisting of: pixel scale factors (column 8, lines 43- 65), an angle at a particular point in a view (column 2, lines 4- 29), and correspondence of one or more pixel values to world values (column 7, lines 3 - 60, column 12, lines 5 - 22). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have modified Toh to include calibration are selected from the group consisting of: pixel scale factors, an angle at a particular point in a view, and correspondence of one or more pixel values to world values. It would have been obvious to one of ordinary skill in the art at the time of invention to have modified Toh by the teaching of Kaplan. The motivation for doing so is to automatically determine the position coordinates of a probe array and the position coordinates of a first die with sufficient accuracy (as suggested by Kaplan at column 3, lines 29- 32).

As per claims 93 and 110, Kaplan discloses the method wherein the calibration includes resolving missing state values of an inspection system by imaging a precision pattern of known dimensions (column 2, lines 52- 62), and spacing (column 22, lines 34- 44, column 25, lines 1 - 10).

As per claims 94 and 111, Kaplan discloses the method wherein the calibration includes determining and storing pixel values of features of a precision pattern of known dimensions and spacing (column 2, lines 52- 62), and spacing (column 22, lines 34- 44, column 25, lines 1 - 10).

As per claims 95 and 112, Kaplan discloses the method wherein the calibration includes determining and storing deviations (column 14, lines 38- 48), from ideal world locations of features of a precision pattern of known dimensions and spacing (column 7, lines 3 - 60, column 19, lines 3- 44).

As per claims 96 and 113, Kaplan discloses the method wherein a Z value is calculated by combining a deviation (column 14, lines 38- 65), of the first lead reference pixel position (column 6, lines 23- 67), from its ideal position with a deviation of the second lead reference pixel position from its ideal position (column 7, lines 21- 60, column 12, lines 4- 65).

As per claims 97 and 114, Kaplan discloses the method comprising: converting world values to Z deviations (column 14, lines 38- 65) by calculating deviation values that represent the deviation of the lead from its ideal position (column 7, lines 21- 60, column 12, lines 4- 65).

As per claims 98 and 115, Toh (040) discloses the method comprising:

converting world values to coplanarity (column 3, lines 34 - 41) values by calculating deviation values that represent the deviation of the lead from a reference plane (column 3, lines 20- 67, column 4, lines 1- 8, column 6, lines 1 - 63).

As per claims 99 and 116, Toh (040) discloses the method further comprising: converting world values to coplanarity values by calculating deviation values that represent the deviation of the lead from a seating plane (column 3, lines 34- 67, column 4, lines 1 - 8).

As per claims 100 and 117, Toh (040) discloses the method where the illuminating is with a diffuse light (lighting provided on the work-plane or on an the object light that is not incident predominantly from any particular direction, fig 3a, item 5, column 3, lines 11- 33, column 4, lines 21 - 37, column 5, lines 9- 21).

As per claims 101 and 118 Toh (040) discloses the method wherein the illuminating is with a diffuse light for the bottom view of the lead (lighting provided on the work-plane or on an the object light that is not incident predominantly from any particular direction, fig 3a, item 5, column 3, lines 11- 33, column 4, lines 21 - 37, column 5, lines 9- 21).

As per claims102 and 119, Toh (040) discloses the method wherein the illuminating with a diffuse light for the side perspective view of the lead (column 3, lines 10- 41, column 5, lines 28- 31, column 6, lines 20- 36).

As per claims 103 and 120, Toh (040) discloses the method wherein the. illuminating is with an overhead reflective diffuser (column 3, lines 10- 41, column 5, lines 28- 31, column 6, lines 20- 36).

Contact Information

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sheela C Chawan whose telephone number is 703-305- 4876. The examiner can normally be reached on Monday - Thursday 6 - 7.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on 703-308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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